

Appl. No. 10/568,767
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AMENDMENTS TO THE CLAIMS:

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This listing of claims will replace all prior versions, and listings, of claims in the application:

1-42 (cancelled).

43 (currently amended). A catalyst composition for the oxidation of ethane, and optionally ethylene, to acetic acid and ethylene, which catalyst composition comprises (i) a support, and (ii), in combination with oxygen, consists of the elements molybdenum, vanadium and niobium, optionally tungsten and a component Z and optionally component Y, in combination with oxygen, which is one or more metals of Group 14 of the Periodic Table of Elements; wherein a, b, c, d and, e and f represent the gram atom ratios of the elements Mo, W, Z, V and, Nb and Y respectively, such that:

$$0 < a \leq 1; 0 \leq b < 1 \text{ and } a + b = 1;$$

$$0.05 < c \leq 2;$$

$$0 < d \leq 2; \text{ and}$$

$$0 < e \leq 1; \text{ and}$$

$$0 \leq f \leq 2;$$

and wherein Z is selected from one or more of Ge, Sn and Pb, and Y is selected from one or more of Cr, Mn, Ta, B, Al, Ga, In, Pt, Zn, Cd, Bi, Ce, Co, Rh, Ir, Cu, Ag, Fe, Ru, Os, K, Rb, Cs, Mg, Ca, Sr, Ba, Ni, P, Si, Ti, U, Re, La, Ti, Hf and Zr, said elements being supported on a support.

44 (previously presented). A catalyst composition according to claim 43 wherein $0.01 < a \leq 1, 0.1 \leq c \leq 2, 0.1 \leq d \leq 2, 0.01 < e \leq 1$.

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45 (previously presented). A catalyst composition according to claim 44 wherein
 $0.1 \leq d \leq 0.5$.

46 (previously presented). A catalyst composition according to claim 44 or claim
45 wherein $0.01 \leq e \leq 0.6$.

47 (previously presented). A catalyst composition according to claim 43 wherein
Z is Sn.

48 (canceled).

49 (currently amended). A catalyst composition according to claim 48-49
wherein Y is selected from the group consisting of Bi, Ca, Ce, Cu, K, P, Sb, La, Hf, Zr,
and Ti and Te.

50 (previously presented). A catalyst composition according to claim 49 wherein
Y is selected from Hf, Ti, and Zr.

51 (previously presented). A catalyst composition according to claim 50 wherein
Y is Ti.

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52 (previously presented). A catalyst composition according to claim 43 which comprises Sn and further comprises, as component Y, Ti.

53 (canceled).

54 (previously presented). A catalyst composition according to claim 52 wherein $0.01 \leq f \leq 0.5$.

55 (canceled).

56 (previously presented). A catalyst composition according to claim 43 wherein the support comprises at least one metal oxide support.

57 (currently amended). A catalyst composition according to claim 56 43 wherein the metal oxide support is selected from silica, titania, titanosilicates, alumina, aluminosilicates, zirconia and mixtures thereof.

58 (currently amended). A catalyst composition according to claim 57 wherein the metal oxide support is selected from silica, titania and a mixture of silica and titania.

59 (previously presented). A catalyst composition according to claim 43 wherein the support is a non-oxide support.

60 (previously presented). A catalyst composition according to claim 43 in which the support comprises from about 20 wt% to 90 wt% of the total weight of the catalyst composition.

61 (previously presented). A catalyst composition according to claim 60 wherein the support comprises from 40 wt% to 60 wt% of the total weight of the catalyst composition.

62 (previously presented). A catalyst composition according to claim 43 or claim 48 in which at least one of aluminium, titanium and zirconium is present in the composition as a component of the support and/or as component Y.

63 (withdrawn). A process for the preparation of a catalyst composition according to claim 43 which process comprises the steps of:

- (a) forming a mixture comprising molybdenum, vanadium, niobium, a support material or a precursor thereof, component Z, and optionally tungsten in a solution;
- (b) drying the mixture to form a dried solid material; and
- (c) calcining the dried solid material to form the catalyst composition.

64 (withdrawn). A process according to claim 61 in which step (a) further comprises a component Y as defined in any one of claims 48 to 51.

65 (withdrawn). A process according to claim 63 wherein the mixture is formed as a solution in water.

66 (withdrawn). A process according to claim 65 wherein the solution has a pH of 2 to 8.

67 (withdrawn). A process according to claims 63 to 66 wherein in step (a) the support material or precursor thereof is added to a pre-formed mixture of molybdenum, vanadium, niobium, component Z, optional tungsten and optional component Y.

68 (withdrawn). A process according to claim 63 wherein the drying process of step (b) is a spray-drying process.

69 (withdrawn). A process according to claim 63 wherein the calcining is carried out by heating the dried solid material to a temperature of 200 to 550° C in air or oxygen for 1 minute to 24 hours.

70 (withdrawn). A process for the production of acetic acid and ethylene from a gaseous mixture comprising ethane, and optionally ethylene, which process comprises contacting in a reaction zone the gaseous mixture with a molecular oxygen-containing gas at elevated temperature in the presence of a catalyst composition as claimed in claims 43 to 62 or as prepared by claims 63 to 69.

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71 (withdrawn). A process according to claim 70 wherein the gaseous mixture comprises ethane and ethylene.

72 (withdrawn). A process according to claim 70 or claim 71 in which water is also present as a feed component.

73 (withdrawn). A process according to claim 70 or claim 71 wherein acetic acid and ethylene are produced in a ratio in the range 0.8 :1 to 1.2 : 1.

74 (withdrawn). A process according to claim 73 wherein the ratio of acetic acid to ethylene is in the range 0.9 : 1 to 1.1 : 1.

75 (withdrawn). A process according to claim 70 wherein the elevated temperature is in the range 200 to 500°C.

76 (withdrawn). A process according to claim 70 wherein the process is carried out at a pressure in the range of 1 to 50 bar.

77 (withdrawn). A process according to claim 70 wherein the catalyst is used in the form of a fixed bed or a fluidised bed.

78 (withdrawn). A process according to claim 70 wherein the overall selectivity to acetic acid and ethylene is at least 70 mol%.

79 (withdrawn). A process according to claim 78 wherein the overall selectivity is at least 75 mol%.

80 (withdrawn). A process as claimed in claim 70 in which at least a portion of the acetic acid and at least a portion of the ethylene is contacted in a second reaction zone with a molecular oxygen-containing gas at elevated temperature in the presence of a catalyst suitable for the production of vinyl acetate to produce vinyl acetate.

81 (withdrawn). A process as claimed in claim 70 in which acetic acid and ethylene are produced in a ratio in the range 0.8 : 1 to 1.2 : 1 and which are contacted in a second reaction zone with a molecular oxygen-containing gas at elevated temperature in the presence of a catalyst suitable for the production of vinyl acetate to produce vinyl acetate.

82 (withdrawn). A process according to claim 80 or claim 81 wherein the second reaction zone is a fluidised bed reactor.

83 (withdrawn). A process as claimed in claim 70 in which at least a portion of the acetic acid and at least a portion of the ethylene is contacted in a second reaction

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zone with a molecular oxygen-containing gas at elevated temperature in the presence of a catalyst suitable for the production of ethyl acetate to produce ethyl acetate.

84 (withdrawn). A process as claimed in claim 70 in which acetic acid and ethylene are produced in a ratio in the range 0.8 :1 to 1.2 : 1 and which are contacted in a second reaction zone with a molecular oxygen-containing gas at elevated temperature in the presence of a catalyst suitable for the production of ethyl acetate to produce ethyl acetate.